

Original Article

Effect of low level laser therapy (LLLT) on post extraction wound healing

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ABSTRACT:

Background: The impaction is define as any tooth that is prevented to reaching its normal position by tissue, bone and another tooth or unerupted tooth, partially erupted tooth in the position of the against another tooth. The former is "physically" blocked in its path of eruption, while the latter is compromised by its lack of eruptive force often without known. Regeneration takes place in three overlapping phases. Low level laser therapy (LLLT) is also known as "soft laser therapy" and bio-stimulation. The use of LLLT in health care has been documented in the literature for more than three decades. Numerous research studies have demonstrated that LLLT is effective for some specific applications in dentistry. **Aim:** To compare the effect of wound healing in progress of with LLLT (low level laser therapy) & Normal procedure, also to compare the Swelling of Mouth with LLLT (low level laser therapy) & Normal procedure, and to compare the Pain with LLLT (low level laser therapy) & Normal procedure. **Materials and Methods:** Thirty patients (15 for test Group & 15 for Control Group) with the same condition of any extraction of teeth composed the sample of this study. Both male and female were included in the study and they were aged between 20 - 40 yrs. In this study, any teeth with history of extraction were included. Patients were divided into two categories. One group compromised test site and other as control site. The study is Prospective Single blind randomize trial. In one day, single side extractions were done, test or control side was randomly selected and followed them in 7 days. Radiographs were evaluated completely for position, type and difficulty index. Procedures of both Groups were performed via same surgeon to prevent the bias. **Results:** As we compared the effect of LLLT, there is no such difference in pain on 1st & 2nd day, but from the third day there is massive reduction in the swelling, Pain and inflammation. **Conclusion:** LLLT show the more effective effect on the pain, swelling & inflammation and increases, the Inter-incisal distance.

Key words: Low level laser therapy, Wound healing.

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INTRODUCTION

The impaction is define as any tooth that is prevented to reaching its normal position by tissue, bone and another tooth or unerupted tooth, partially erupted tooth in the position of the against another tooth. The former is "physically" blocked in its path of eruption, while the latter is compromised by its lack of eruptive force often without known. Regeneration takes place in three overlapping phases: [1]

- i). Inflammatory phase:-lasts several hours, the damaged tissue is infiltrated with the leukocytes and macrophages infiltration and fibroblasts migration, which also occurs and lasts from 1 to 3 days.
- ii). Proliferation phase: between second and fourth day -

neovascularisation, type III collagen synthesis occurs between day 2 and 16.

- iii). Tissue reconstruction phase: In day 9 to 60 the type III collagen is replaced with type I, the amount of blood vessels is reduced and the reconstruction of fibrous tissue than continues for 6 to 12 months. After the extraction the open space of spongiosis is filled with blood clot. The re-growth of vein is followed by cells from healing bone marrow. These cells are changed to osteoblasts. The bone is gradually strengthened by lamellar bone. This primary spongiosis structure is, depending on the local conditions, transformed into compact cortical or lamellar bone. The formation of cortical layer, secondary spongiosis and marrow spaces takes approximately four months. The final

phase of bone differentiation then takes place, where bone is re-modeled into Haversian systems and secondary osteons appear. In the extraction socket the neovascularisation starts. The oxygen supply increases. The oxygen is needed for collagen synthesis and wound epithelisation. The components needed for collagen synthesis are provided by phagocytes via damaged tissue. Consecutively, the collagen is transformed into a specific form, the further cell dividing stops, and the veins created by neovascularisation are reduced. The wound surface is epithelised, and the tissue is healed.

Low Level Laser Therapy- what is it?

Low level laser therapy (LLLT) is also known as “soft laser therapy” and bio-stimulation. The use of LLLT in health care has been documented in the literature for more than three decades. Numerous research studies have demonstrated that LLLT is effective for some specific applications in dentistry [2]. The LLLT literature is large, with more than 1000 papers published on this topic. A problem in dissecting this literature is the variation in methodology and dosimetry between different studies. Not only have a range of different wavelengths been examined, but exposure times and the frequency of treatments also vary. The inclusion of sham-irradiated controls in clinical studies is an important element, since placebo effects can be important, particularly in terms of the level of pain experienced and reported following treatment [2].

While broad band light can exert effects on cells [3-4], interest has been concentrated on using lasers as a light source because of their greater therapeutic effect. While much of the initial work with LLLT used the helium-neon gas laser (632.8 nm), nowadays most LLLT clinical procedures are undertaken using semi-conductor diode lasers, for example, gallium arsenide-based diode lasers operating at 830 nm or 635 nm wavelengths [5]. Since wavelength is the most important factor in any type of photo-therapy, the clinician must consider which wavelengths are capable of producing the desired effects within living tissues.

The typical power output for a low level laser device used for this therapy is in the order of 10-50 milliWatts, and total irradiances at any point are in the order of several Joules. Thermal effects of LLLT on dental tissues are not significant [6], and do not contribute to the therapeutic effects seen. The wavelengths used for LLLT have poor absorption in water, and thus penetrate soft and hard tissues from 3 mm to up to 15 mm. The extensive penetration of red and near-infrared light into tissues has been documented by several investigators [7]. As the energy penetrates tissues, there is multiple scattering by both erythrocytes and microvessels. Because of this, both blood rheology and the distribution of microvessels in the tissue influence the final distribution pattern of laser energy [2].

AIMS AND OBJECTIVE:

The aim of the study is to evaluate effect of low level laser

therapy (LLLT) on post extraction wound healing.

Objective:

1. To compare the effect of wound healing in progress of with LLLT (low level laser therapy) & Normal procedure.
2. To compare the Swelling of Mouth with LLLT (low level laser therapy) & Normal procedure.
3. To compare the Pain with LLLT (low level laser therapy) & Normal procedure.

MATERIALS AND METHOD:

Thirty patients (15 for test Group & 15 for Control Group) with the same condition of any extraction of teeth composed the sample of this study. Both male and female were included in the study and they were aged between 20 - 40 yrs. The study was approved by the ethical committee of RKDF Dental College & Research Centre, Bhopal, Madhya Pradesh, India. Duration of study was One & Half Years (From December 2016 to May 2018). In this study, any teeth with history of extraction were included. Patients were divided into two categories. One group compromised test site and other as control site. The study is Prospective Single blind randomize trial. Exclusion criteria were chronic diseases - pregnancy- known allergy to local anesthetics - recent history of chronic pain medication. Informed consent was obtained from participating patients.

Thirty healthy Patients with impacted teeth reported in Department of Oral & maxillofacial Surgery at RKDF Dental College & Research Centre, Bhopal, Madhya Pradesh, india. In one day, single side extractions were done, test or control side was randomly selected and followed them in 7 days.

Radiographs were evaluated completely for position, type and difficulty index. Procedures of both Groups were performed via same surgeon to prevent the bias.

Initially patient was prepared and followed by the inferior alveolar nerve block was given by xylocaine and adraniline (1:200000). Ward (Envelope) incision is marked and mucoperiosteal flap is elevated by periosteal elevator. Than guttering of the bone done from the distal side to the alveolar bone expose the tooth and made the purchase point. Tooth was luxate from the mesial side in every patient of this study. After tooth is elevated bone filling done with a filler or straight fissure to make the wall of bony socket smooth and followed by the irrigation with normal saline and Betadine. Wound is closed by interrupted suture round body 3-0 silk. Post-operative instructions are given to the patients.

On the Test Group LLLT were irradiated after 1 hour at frequency of 80mW and energy output is 4J/cm² for 4 minutes and postoperative medication (antibiotics & analgesic) prescribed and continue for the four days.

On the control Group only medication are prescribed LLLT was not given on this Group. Swelling, pain and Inter-incisal distance were compared both Groups on 3rd, 5th and 7th day.

RESULTS:

As we compared the effect of LLLT, there is no such difference in pain on Ist & IInd day, but from the third day there is massive reduction in the swelling, Pain and inflammation. Table1 shows no significant difference between ages of both Groups. Table 2 shows no significant difference between Genders of both Groups. Table 3 shows significant Variation between different time periods in LLLT Group. Table 4 shows significant variation between different time periods in Without LLLT Group. Table 5 shows significant difference in both procedures in 3rd, 5th & 7th day but not in initial day. Table 6 shows significant Variation between different time periods in LLLT Group. Table 7 shows significant Variation between different time periods in Without LLLT Group. Table 8 shows significant difference in both procedures in 5th & 7th day but not in initial & 3rd day. Table 9 shows significant Variation

between different time periods in LLLT Group. Table 10 shows significant Variation between different time periods in Without LLLT Group. Table 11 shows significant difference in both procedures in 3rd, 5th & 7th day but not in initial day. Table 12 shows significant Variation between different time periods in LLLT Group. Table 13 shows significant Variation between different time periods in Without LLLT Group. Table 14 shows significant difference in both procedures in 3rd, 5th & 7th day but not in initial day.

STATISTICAL ANALYSIS:

Statistical analysis of data is done by help of SPSS V21.0 Software (trial Version). And Chi square test, Unpaired T test, One way ANOVA (Analysis of Variance) with Tukey’s HSD test, Kruskal-Wallis test & Mann-Whitney U test is use in data analysis.

TABLE 1: Age wise distribution of the patient of Both Groups
Group Statistics

	Group	N	Mean	Std. Deviation	T Value	P value
Age	With LLLT	15	30.4000	6.63110	0.825	0.913
	Without LLLT	15	30.1333	6.55599		

TABLE 2: Gender wise distribution of the patient of Both Groups

	Gender	Group		Total	Chi Sq	P value
		With LLLT	Without LLLT			
Female		4	5	9	0.159	0.690
		44.4%	55.6%	100.0%		
Male		11	10	21	0.159	0.690
		52.4%	47.6%	100.0%		
Total		15	15	30	0.159	0.690
		50.0%	50.0%	100.0%		

TABLE 3: Distribution of Width of Socket in different time period in LLLT Group (Inter Group)

	N	Mean	Std. Deviation	F Value	P value
Inital Day	15	9.9333	.30394	67.169	<0.0001
Day 3 rd	15	9.3400	.35817		
Day 5 th	15	8.6267	.43991		
Day 7 th	15	7.9200	.51575		
Total	60	8.9550	.86150		

TABLE 3.1: Pair wise comparison of all days (Post Hoc Test)

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Inital Day	Day 3 rd	.59333*	.15058	.001
	Day 5 th	1.30667*	.15058	.000
	Day 7 th	2.01333*	.15058	.000
Day 3 rd	Day 5 th	.71333*	.15058	.000
	Day 7 th	1.42000*	.15058	.000
Day 5 th	Day 7 th	.70667*	.15058	.000

HSD_{0.05} = 13.12

TABLE 4: Distribution of Width of Socket in different time period in Without LLLT Group (Inter Group)

	N	Mean	Std. Deviation	F Value	P value
Inital Day	15	9.9200	.29326	33.126	<0.0001
Day 3 rd	15	9.6800	.29326		
Day 5 th	15	9.2667	.36384		
Day 7 th	15	8.7267	.43665		
Total	60	9.3983	.57090		

TABLE 4.1: Pair wise comparison of all days (Post Hoc Test)

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Inital Day	Day 3rd	.24000	.12846	.253
	Day 5th	.65333*	.12846	.000
	Day 7th	1.19333*	.12846	.000
Day 3rd	Day 5th	.41333*	.12846	.011
	Day 7th	.95333*	.12846	.000
Day 5th	Day 7th	.54000*	.12846	.001

HSD_{0.05} = 9.36

TABLE 5: Distribution of Width of Socket in different time period in Both Groups (Intra Group)

Group Statistics

	Group	N	Mean	Std. Deviation	T Value	P Value
Width of Socket on Initial day	With LLLT	15	9.9333	.30394	0.122	0.904
	Without LLLT	15	9.9200	.29326		
Width of Socket on 3rd day	With LLLT	15	9.3400	.35817	2.845	0.008
	Without LLLT	15	9.6800	.29326		
Width of Socket on 5th day	With LLLT	15	8.6267	.43991	4.342	<0.0001
	Without LLLT	15	9.2667	.36384		
Width of Socket on 7th day	With LLLT	15	7.9200	.51575	4.623	<0.0001
	Without LLLT	15	8.7267	.43665		

TABLE 6: Distribution of Depth of Socket in different time period in LLLT Group (Inter Group)

	N	Mean	Std. Deviation	F Value	P value
Inital Day	15	8.6067	.42673	28.701	<0.0001
Day 3rd	15	8.0400	.51796		
Day 5th	15	7.5533	.53966		
Day 7th	15	6.9667	.52735		
Total	60	7.7917	.78358		

TABLE 6.1: Pair wise comparison of all days (Post Hoc Test)

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Inital Day	Day 3 rd	.56667*	.18437	.017
	Day 5 th	1.05333*	.18437	.000
	Day 7 th	1.64000*	.18437	.000
Day 3rd	Day 5 th	.48667	.18437	.049
	Day 7 th	1.07333*	.18437	.000
Day 5th	Day 7 th	.58667*	.18437	.012

HSD_{0.05} = 11.23

TABLE 7: Distribution of Depth of Socket in different time period in Without LLLT Group (Inter Group)

	N	Mean	Std. Deviation	F Value	P Value
Inital Day	15	8.6200	.46476	5.760	0.002
Day 3rd	15	8.3800	.48433		
Day 5th	15	8.1600	.46414		
Day 7th	15	7.9400	.47026		
Total	60	8.2750	.52485		

TABLE 7.1: Pair wise comparison of all days (Post Hoc Test)

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Inital Day	Day 3 rd	.24000	.17196	.507
	Day 5 th	.46000*	.17196	.047
	Day 7 th	.68000*	.17196	.001
Day 3rd	Day 5 th	.22000	.17196	0.46
	Day 7 th	.44000	.17196	0.043
Day 5th	Day 7 th	.22000	.17196	0.032

HSD_{0.05} = 8.62

TABLE 8: Distribution of Depth of Socket in different time period in Both Groups (Intra Group)

Group Statistics

	Group	N	Mean	Std. Deviation	T value	P value
Depth of Socket on Initial day	With LLLT	15	8.6067	.42673	0.082	0.935
	Without LLLT	15	8.6200	.46476		
Depth of Socket on 3rd day	With LLLT	15	8.0400	.51796	1.857	0.074
	Without LLLT	15	8.3800	.48433		
Depth of Socket on 5th day	With LLLT	15	7.5533	.53966	3.301	0.003
	Without LLLT	15	8.1600	.46414		
Depth of Socket on 7th day	With LLLT	15	6.9667	.52735	5.335	<0.0001
	Without LLLT	15	7.9400	.47026		

TABLE 9: Distribution of Swelling in different time period in LLLT Group (Inter Group)

	N	Mean	Std. Deviation	F value	P value
Inital Day	15	7.4067	.31728	871.72	<0.0001
Day 3rd	15	2.4333	.74226		
Day 5th	15	.2733	.39725		
Day 7th	15	.0000	.00000		
Total	60	2.5283	3.02700		

TABLE 9.1: Pair wise comparison of all days (Post Hoc Test)

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Inital Day	Day 3 rd	4.97333*	.16426	.000
	Day 5 th	7.13333*	.16426	.000
	Day 7 th	7.40667*	.16426	.000
Day 3rd	Day 5 th	2.16000*	.16426	.000
	Day 7 th	2.43333*	.16426	.000
Day 5th	Day 7 th	.27333	.16426	.352

HSD_{0.05} = 9.12

TABLE 10: Distribution of Swelling in different time period in Without LLLT Group (Inter Group)

	N	Mean	Std. Deviation	F Value	P Value
Initial Day	15	7.4200	.25690	638.367	<0.0001
Day 3rd	15	4.9867	.65669		
Day 5th	15	1.8467	.60103		
Day 7th	15	.2200	.33637		
Total	60	3.6183	2.84870		

TABLE 10.1: Pair wise comparison of all days (Post Hoc Test)

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Initial Day	Day 3 rd	2.43333*	.17996	.000
	Day 5 th	5.57333*	.17996	.000
	Day 7 th	7.20000*	.17996	.000
Day 3rd	Day 5 th	3.14000*	.17996	.000
	Day 7 th	4.76667*	.17996	.000
Day 5th	Day 7 th	1.62667*	.17996	.000

HSD_{0.05} = 13.25

TABLE 11: Distribution of Swelling of mouth in different time period in Both Groups (Intra Group)

Group Statistics

	Group	N	Mean	Std. Deviation	T value	P value
Sweling of Mouth on Initial day	With LLLT	15	7.4067	.31728	0.126	0.900
	Without LLLT	15	7.4200	.25690		
Sweling of Mouth on 3rd day	With LLLT	15	2.4333	.74226	9.978	<0.0001
	Without LLLT	15	4.9867	.65669		
Sweling of Mouth on 5th day	With LLLT	15	.2733	.39725	8.458	<0.0001
	Without LLLT	15	1.8467	.60103		
Sweling of Mouth on 7th day	With LLLT	15	.0000	.00000	2.533	0.017
	Without LLLT	15	.2200	.33637		

TABLE 12: Distribution of Pain in different time period in LLLT Group (Inter Group)

Ranks

	Group	N	Mean Rank	K Value	P value
Pain	Initial Day	15	53.00	53.828	<0.0001
	Day 3 rd	15	37.63		
	Day 5 th	15	18.37		
	Day 7 th	15	13.00		
	Total	60			

TABLE 13: Distribution of Pain in different time period in Without LLLT Group (Inter Group)

Ranks

	Group	N	Mean Rank	K Value	P value
Pain	Initial Day	15	51.07	52.036	<0.0001
	Day 3 rd	15	39.53		
	Day 5 th	15	22.93		
	Day 7 th	15	8.47		
	Total	60			

TABLE 14: Distribution of swelling of mouth in different time period in Both Groups (Intra Group)

Ranks		Group	N	Mean Rank	Sum of Ranks	U Value	P value
Pain on Initial day	With LLLT		15	16.53	248.00	0.682	0.495
	Without LLLT		15	14.47	217.00		
	Total		30				
Pain on 3rd day	With LLLT		15	8.60	129.00	4.387	<0.0001
	Without LLLT		15	22.40	336.00		
	Total		30				
Pain on 5th day	With LLLT		15	8.37	125.50	4.582	<0.0001
	Without LLLT		15	22.63	339.50		
	Total		30				
Pain on 7th day	With LLLT		15	11.50	172.50	3.230	<0.0001
	Without LLLT		15	19.50	292.50		
	Total		30				

DISCUSSION:

The extraction of tooth is very panic procedure for patient. The swelling of mouth is take time to reduce. Healing process is also a challenging for surgeon it takes time up to 15 to 30 day (for complete healing). In our study, I see that the LLLT procedure is better for healing the wound, reducing the swelling and pain of the patients. Age: there is no significant difference in mean age of both group (p>0.05). Gender: there is no any association between genders in both groups.

Width of Socket:

In LLLT procedure width of socket is significantly reduce day by day and according to mean the width of wound (Socket) is reduce from 9.93 mm to 7.92 mm . In pair wise comparison the reduction of width is also significantly reduce initial day to day 3rd, Initial day to 5th day, Initial day to 7th day and 3rd day to 5th day, 3rd day to 7th day and also significant difference in 5th day to 7th day. These mean the LLLT procedure is better to reduce the width of Socket from initial day to 7th day.

In Without LLLT procedure width of socket is significantly reduce day by day and according to mean the width of wound (Socket) is reduce from 9.92 mm to 8.73 mm . in pair wise comparison the reduction of width is also significantly reduce Initial day to 5th day , Initial day to 7th day and 3rd day to 5th day , 3rd day to 7th day and also significant difference in 5th day to 7th day but not significant reduction on Initial day to 3rd day. These mean the without LLLT procedure is take time to reduce the width of socket.

In study when we comparing the both procedure LLLT & without LLLT in Initial day there is no any significant difference found it means the both procedures started in equal chance. On day 3rd there is significant difference in both procedure and according to mean the LLLT procedure is better than Without LLLT procedure. On day 5th there is significant difference in both procedure and according to mean the LLLT procedure is better than Without LLLT procedure. On day 7th there is significant difference in both procedure and according to mean the LLLT procedure is

better than Without LLLT procedure. Over all we say that the LLLT Procedure is better than Without LLLT Procedure in day by day progress.

Depth of Socket:

In LLLT procedure Depth of socket is significantly reduce day by day and according to mean the depth of wound (Socket) is reduce from 8.61 mm to 6.97 mm. In pair wise comparison the reduction of depth is also significantly reduce initial day to day 3rd, Initial day to 5th day, Initial day to 7th day and 3rd day to 5th day, 3rd day to 7th day and also significant difference in 5th day to 7th day. These mean the LLLT procedure is better to reduce the depth of Socket from initial day to 7th day.

In Without LLLT procedure depth of socket is significantly reduce day by day and according to mean the depth of wound (Socket) is reduce from 8.62 mm to 7.94 mm . in pair wise comparison the reduction of depth is also significantly reduce Initial day to 5th day , Initial day to 7th day and 3rd day to 5th day , 3rd day to 7th day and also significant difference in 5th day to 7th day but not significant reduction on Initial day to 3rd day. These mean the without LLLT procedure is take time to reduce the depth of socket.

In study when we comparing the both procedure LLLT & without LLLT in Initial day there is no any significant difference found it means the both procedures started in equal chance. On day 3rd there is also no significant difference in both procedures. On day 5th there is significant difference in both procedure and according to mean the LLLT procedure is better than Without LLLT procedure. On day 7th there is significant difference in both procedure and according to mean the LLLT procedure is better than Without LLLT procedure. over all we say that the LLLT Procedure is better than Without LLLT Procedure in day by day progress to reducing the depth of socket.

Swelling of Mouth:

In LLLT procedure Swelling of mouth is significantly reduce day by day and according to mean the Swelling of

mouth is reduce from 8.61 mm to 0.00 mm. in pair wise comparison the reduction of swilling of mouth is also significantly reduce initial day to day 3rd, Initial day to 5th day, Initial day to 7th day and 3rd day to 5th day, 3rd day to 7th day but no significant difference in 5th day to 7th day because in 5th day the swilling of mouth is partially present and 7th day completely reduce the swilling. These mean the LLLT procedure is better to reduce the Swelling of Mouth from initial day to 7th day.

In Without LLLT procedure swilling of mouth is significantly reduce day by day and according to mean the swilling of mouth is reduce from 7.42 mm to 0.22 mm. in pair wise comparison the reduction of swilling of mouth is also significantly reduce Initial day to 3rd day, Initial day to 5th day, Initial day to 7th day and 3rd day to 5th day, 3rd day to 7th day and also significant difference in 5th day to 7th day. These mean the without LLLT procedure is take time to reduce the swilling of mouth.

In study when we comparing the both procedure LLLT & without LLLT in Initial day there is no any significant difference found it means the both procedures started in equal chance. On day 3rd there is significant difference in both procedure and according to mean the LLLT procedure is better than Without LLLT procedure. On day 5th there is significant difference in both procedure and according to mean the LLLT procedure is better than Without LLLT procedure. On day 7th there is significant difference in both procedure and according to mean the LLLT procedure is better than Without LLLT procedure. Over all we say that the LLLT Procedure is better than Without LLLT Procedure in day by day progress to reducing the swilling of mouth .and according to mean reduction LLLT is completely reduce the swilling in 7th day but Without LLLT procedure swilling is not completely reduce on 7th day.

Pain:

In LLLT procedure pain is significantly reduce day by day and according to mean rank the pain is reduce from rank 53.00 to 13.00.

In Without LLLT procedure pain is significantly reduce day by day and according to mean rank the pain is reduce from rank 51.07 to 8.47.

In study when we comparing the both procedure LLLT & without LLLT in Initial day there is no any significant difference found it means ranks the both procedures started in equal chance. On day 3rd there is significant difference in both procedure and according to mean rank LLLT Procedure is better than Without LLLT Procedure. On day 5th there is significant difference in both procedure and according to mean rank the LLLT procedure is better than Without LLLT procedure. On day 7th there is significant difference in both procedure and according to mean rank the LLLT procedure is better than Without LLLT procedure. Over all we say that the LLLT Procedure is better than Without LLLT Procedure in day by day

progress to reducing the pain.

Conclusion:

After evaluation of the results of this study and comparing it with other studies carried out universally we were able to conclude the following:

That LLLT show the more effective effect on the pain, swelling & inflammation and increases, the Inter-incisal distance.

The pain was evaluated by using visual analogue scale (VAS). Swelling was measured on the following criterias:

- Outer canthus to the inferior border of angle of mandible.
- Tragus to corner of mouth.
- Tragus to pogonion.

The unique pain reduction abilities of LLLT (Low Level Laser Therapy) have been extensively researched and documented in numerous clinical studies and medical papers. Because the pain amelioration capabilities of LLLT are accomplished via the combination of local and systemic actions - utilizing enzymatic, chemical and physical interventions - the process is very complex. However, there is a preponderance of medical evidence that justifies a conclusion that effective pain reductions can be achieved via increase in b-Endorphins, blocked depolarization of C-fiber afferent nerves, increased nitric oxide production, increased nerve cell action potential, axonal sprouting and nerve cell regeneration, decreased Bradykinin levels, increased release of acetylcholine or ion channel normalization.

The results of this study indicated that postoperative use of low-power laser irradiation after surgical extraction of third molars significantly reduces postoperative pain, Compared with the postoperative analgesic effect of diclofenac sodium that was beneficial but less prominent. The Influence of preoperative use of diclofenac sodium on postoperative pain after removal of impacted lower third molars was investigated before.

Positive laser effect was used for the prevention of pain, swelling or trismus after removal of third molars The use of therapeutic laser in the postoperative management of patients having surgical removal of impacted third molars, decreased postoperative pain, swelling, and trismus.

Low level laser therapy has been found to accelerate wound healing and reduce pain, possibly by stimulating oxidative phosphorylation in mitochondria and modulating inflammatory responses. By influencing the biological function of a variety of cell types, it is able to exert a range of several beneficial effects upon inflammation and healing. LLLT exerts marked effects upon cells in all phases on wound healing, but particularly so during the proliferative phase.

There is good evidence that the enhanced cell metabolic functions seen after LLLT are the result of activation of photo-receptors within the electron transport chain of

mitochondria. The result of, this study indicated that postoperative LLLT with Analgesia and Antibiotics after the surgical removal of the 3rd molar reduces post-operative pain, inflammation, Swelling and trismus as compared with Postoperative Analgesia (diclofenac sodium) and Antibiotics as compared.

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