

## The effect of 2 different techniques in second stage implant surgery

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### ABSTRACT

**Background:** Dental implant is one of the most important options for teeth replacement. In two stage implant surgery, a few options could be used for uncovering implants, scalpel and laser are both considered as effective methods for this purpose.

**The Aim of the study:** To compare soft tissue laser and scalpel for exposing implant in 2<sup>nd</sup> stage surgery in terms of the need for anesthesia, duration of procedure and pain level assessment at day 1 and day 7 post operatively using visual analogue scale .

**Materials and methods:** Ten patients who received bilateral implants participated after healing period completed, gingival depth over each implant was recorded and then implant(s) were exposed by either scalpel or laser with determination for the need of anesthesia. Duration of the procedure was calculated in each case and post-operative pain was assessed by Visual analogue scale at day 1 and day 7.

**Results:** Statistically significant difference in the need of anesthesia was found. A non-significant difference in the duration of the operation was found between the two methods. Non-significant difference was found between the two methods regarding post-operative pain at day 1, with the day 7 scores "no pain or zero pain score" in all the cases by the two methods. A directional significant correlation was found between depth of the gingival tissue over the implants and duration of the procedures regardless of the method used.

**Conclusion:** diode laser can be used effectively for uncovering implants, providing both the dentist and the patient with additional advantages over the conventional methods. Although there was insignificant difference in pain scoring, however implant exposure by laser was more preferred by the patients.

**Keywords:** laser, scalpel, implant. (Received: 10/12/2017; Accepted: 18/1/2018)

### INTRODUCTION

With increasing need of the patients to seek a way to replace their lost dentition, implants field of dentistry has developed more over the past decades. Dental problems that were the most difficult in the past can now be solved with the assistance of dental implants. A few options are available now for completely or partially edentulous patients or even in the cases of a single tooth missing. They include tissue supported restorations (partial and complete removable dentures), and tooth supported restorations (bridges); one of the most recently effective options is the development of bone supported restorations (implants) developed by the pioneering work of the Swedish orthopedic surgeon P.I. Branemark.<sup>(1,2)</sup>

Patients can now enjoy the security and function of fixed restorations after missing natural teeth<sup>(3,4)</sup>.

The types of dental implant are classified according to the technique used; they are either 'One-stage' or 'Two-stage' surgery<sup>(5)</sup>.

After completing the 1<sup>st</sup> stage of surgery and osseo-integration confirmed. The 2<sup>nd</sup> stage involves exposing the implant to prepare for the next step. This exposure could be done in a variety of methods using Puncher, scalpel incisions, ceramic burs, or laser.<sup>(6,7)</sup>

Due to the myriad of laser's advantages, it quickly established a vital solid role in the field of dentistry in particular soft tissue lasers for oral surgery that are becoming widely used over conventional methods due to its beneficial effects regarding hemostasis, visualization of surgical site, minimal swelling, extremely small zone of thermal necrosis in surrounding tissues, reduced post-operative pain, and to perform procedures without the need for anesthesia<sup>(8)</sup>

### AIM OF THE STUDY:

The aim of this study is to compare between soft tissue laser and scalpel for exposing implant in 2<sup>nd</sup> stage surgery in terms of the need for anesthesia , duration of procedure and the pain level assessment at day 1 and day 7 post operatively using visual analogue scale VAS.

### MATERIALS AND METHODS:

Ten patients with bilateral submerged implants participated in this study that was conducted at the Department of oral and maxillofacial surgery in the College of dentistry University of Baghdad in the period from December 2016 to March 2017. Four of them were male and six of them were female. Their ages ranged from 26 to 57 years old. The details of the procedure were discussed with the patient and proceeded after patient's approval.

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All patients had abundant zone of keratinized mucosa underwent 2<sup>nd</sup> stage implant surgery after at least 3 months from the 1<sup>st</sup> stage. This study was designed as split-mouth study in which in one side implants were exposed by using scalpel. In the other side, implants were exposed using 820-980 nm with 2.5 watt power soft tissue diode laser in continuous mode of emission (Quick lase UK) with fiber-optic tip 400 micrometer. Total number of implants were twenty-two implants, eleven implants were exposed by laser and the remaining 11 implant were exposed by scalpel.

**Exclusion criteria:**

1. Any patients with exposed cover screw.
2. Any patients with limited keratinized mucosa that preclude the use of laser.

For comparison of the two methods, the following parameters were assessed:

1. The need of anesthesia by yes or no word.
2. The duration of the procedures in seconds.
3. The depth of gingival tissue above the implant
4. The postoperative pain at day 1 and at day 7 by VAS with 0 value representing no pain and 100 representing the worst imaginable pain. Data were collected in a specially designed case sheet.

The sites of the implants were localized, gingival depth over each implant was measured using endodontic file and stopper, and sizes of the embedded implants were documented in case sheets. For implants uncovered by scalpel, an injectable local anesthesia was used in all patients while for implants uncovered by laser; no anesthesia was used except in one case.

**Techniques for second stage surgery:**

After giving local anesthesia, we proceeded with mid-crestal incision by scalpel for exposing dental implants in one side (fig. 2). As for the other side, we used circular method of laser ablation for exposing dental implant (fig. 3 and 4). Appropriate goggle was worn and laser device operated in 2.5 watt (fig. 1), then initiation of the tip on a dark colored paper was done to make sure that the power of laser at the tip is exactly the same power exit the device. The cutting procedure starts and any carbonized ablated tissue remain in the tip can be removed using small cotton roll. Time calculated from the start of the operation until untightening the cover screw. Patients were instructed to refrain from taking any analgesics.

**Post-operative work:**

Participants were asked to assess their pain bilaterally by subjective method using visual analogue scale VAS at day one and at day 7 post-operatively (without taking any medication at that time).with the following values and its meaning:

0 no pain  
 10-30 mild Pain  
 (nagging interfering little with activities of daily living)  
 40-60 Moderate Pain  
 (interferes significantly with activities of daily living)  
 70-100 Severe Pain  
 (disabling; unable to perform activities of daily living) Pain scale was then converted to values of 0-10.

**Statistical analysis:**

All the data were subjected to computerized statistical analysis using SPSS program. Paired t test, chi square test and Fisher exact probability test were used to evaluate the significance of the parameters. In the statistical evaluation, the following levels of

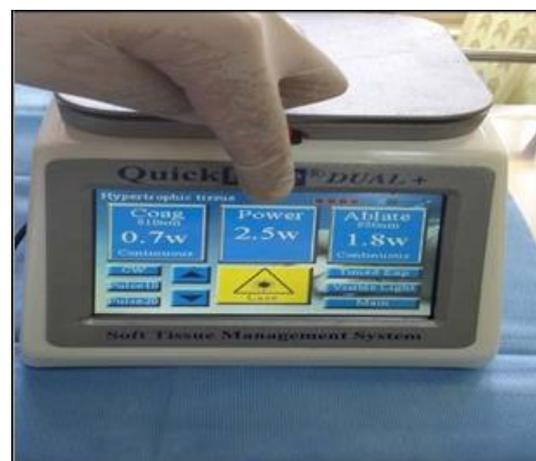
The level of statistical significance was set at  $P \leq 0.05$ .

**Pearson test:**

was also used to determine the correlation between the depth and duration of the procedure, which is a measure of the linear correlation between two variables, It has a value ranges between +1 and -1, where +1 is total positive linear correlation means that the two variables are directly proportional to each other, 0 is no linear correlation, and -1 is total negative linear correlation (the two variables are inversely proportional to each other). The more that is the value closer to + 1, the more it is a strong positive correlation and the more the value is closer to - 1 the stronger the anti-correlation between the two variables.

Values of Pearson test:

- .001 - .19 “very weak”
- .20 - .39 “weak”
- .40 - .59 “moderate”
- .60 - .79 “strong”
- .80 - 1.0 “very strong”



**Figure (1) laser device in 2.5 watt**



Figure (2) crestal incision



Figure (3) implant exposure by laser



Figure (4): Bilateral implant exposure by laser for the right side of the patient and scalpel for the left side.

**RESULTS:**

**The sample:**

In this clinical split mouth study, ten patients that previously underwent bilateral implant surgery had been included, four males (40%) and six females (60%) age ranged from 26 to 67 years with a total number of twenty two implants, eleven implants (50%) had been exposed using scalpel in one side and the other eleven (the remaining 50%) had been exposed using diode laser in the opposite side.

**Descriptive analysis:**

Throughout the exposure procedure certain parameters had been recorded including gingival depth over the implant in millimeters, the need of anesthesia, duration of the procedure in seconds and the pain using VAS at day one and day seven post-operatively.

**Table (1): The sum, the mean, and the standard deviation of gingival depth of both groups**

	Depth / laser (mm)	Depth / scalpel (mm)
	4	7
	4	5
	3	6
	5	1
	1	1
	3	1
	1	1
	2.5	2.5
	2.5	2
	3	2
	2.5	3.5
<b>Sum</b>	<b>31.5</b>	<b>32</b>
<b>Mean</b>	<b>2.8636</b>	<b>2.9090</b>
<b>St.Dev</b>	<b>1.206</b>	<b>2.177</b>

In the implants exposed by scalpel local anesthesia had been given while in those exposed by laser no local anesthetics had been used except in one patient.

**Table (2): Distribution of patients according to the need of anesthesia in laser and scalpel sites**

Groups	With anesthesia	Without anesthesia
<b>Laser exposure</b>	1	10
<b>Scalpel exposure</b>	11	0

The duration of the procedures had been recorded in seconds for all implants from the beginning until untightening of the cover screw.

**Table (3): The sum, mean and standard deviation of the duration of the two procedures.**

	Laser Duration (SEC.)	Scalpel duration (SEC.)
	79	90
	90	112
	77	89
	121	37
	35	41
	64	118
	73	90
	65	75
	50	78
	66	77
	79	113
<b>Sum</b>	<b>799</b>	<b>920</b>
<b>Mean</b>	<b>72.636</b>	<b>83.636</b>
<b>St. Dev.</b>	<b>22.015</b>	<b>26.647</b>

The pain had been recorded using VAS (from 1-10). The minimum pain score registered was 0 and the maximum score was 3 in both groups at day one while the score was 0 at day seven.

**Table (4): Pain scores at day one post-operative in the 2 methods**

Method	Pain Score 0	Pain Score 1	Pain Score 2	Pain Score 3	Total row
Laser	0	3	4	4	11
Scalpel	2	1	4	4	11
<b>Total column</b>	2	4	8	8	n=22

**Inferential analysis:**

❖ Regarding the need for anesthesia in both groups the chi square test had been used to show the significance between the two groups (table 5)

**Table (5): Comparison between the groups according to the need of anesthesia.**

Method	Need anesthesia	No need for anesthesia	Row total
laser	1	10	11
scalpel	11	0	11
<b>Column total</b>	12	10	n=22
<b>P value = 0.00001858</b>			

❖ Regarding the duration of the two procedures the mean value for the laser group was **72.636 seconds** and for scalpel group was **83.636 seconds**. The level of significance had been concluded using paired t test as shown in table (6)

**Table (6): Comparison of the duration of the procedures between the two groups.**

Average duration in seconds	Laser	Scalpel
	72.636	83.636
<b>Paired t test</b>	<b>P value= 0.303781263604871 NS</b>	

❖ Regarding the pain score between the two groups the p value had been concluded using Fisher exact probability test as shown in the table (7)

**Table (7): comparison of the pain scores between the groups.**

	Minimum	Maximum
Pain score in laser	1	3
Pain score in scalpel	0	3
<b>P value=0.493 NS</b>		

NS: Non-significant difference

❖ Correlation between the gingival depth and duration of the procedure had been calculated using Pearson Correlation as shown in the table (8).

**Table (8): correlation between the gingival depth and duration of the procedure calculated using Pearson Correlation.**

		depth	Time
Depth	Pearson Correlation	1	.494(*)
	<b>Sig. (2-tailed)</b>		<b>0.020</b>
	N	22	22
Time	Pearson Correlation	.494(*)	1
	<b>Sig. (2-tailed)</b>	<b>0.020</b>	
	N	22	22
<b>*. Correlation is significant at the 0.05 level (2-tailed).</b>			

## DISCUSSION:

Second stage implant surgery could be done in a variety of methods including scalpel, puncher, electrosurgery and laser<sup>(3)</sup>. Each method carries its own advantages and disadvantages. This study was designed to compare between scalpel and laser regarding specific parameters:

### The need of anesthesia:

The need of anesthesia was significantly different between the two methods. Local anesthetics had not been administered in laser in most of patients. This agrees with El-Kholey who stated that one of the laser advantages is the elimination of injectable anesthesia in second stage implant surgery<sup>(9)</sup>. Hussain A. Jawad, and his colleague stated that the rapid cell vaporization by laser causes loss of intracellular fluid, coagulation of biomolecules, denaturation of intracellular substance and protein which explains the absence or the reduced need of local anesthesia to perform laser surgery in comparison to the scalpel incision<sup>(10,11)</sup>. Arnabat-Dominguez et al. also stated that it is possible to obviate the need of local anesthesia in many of the 2<sup>nd</sup> stage implant operation preformed. Furthermore, when anesthesia was unavoidable the amount required was smaller than in conventional method<sup>(12)</sup>.

### Duration of the procedure:

Although there was non-significant difference in the duration between the two methods, laser provided a quicker operation. This study comes in agreement with the study of Arnabat-Dominguez and the study of El-Kholey who concluded that there is insignificant shortening of surgical time with laser in comparison to scalpel<sup>(9,12)</sup>. This goes in contrast with Andrew Rossi who stated that uncovering dental implant took a significantly more time than uncovering with scalpel, this might be related to practitioner's skill as mentioned by Andrew that the practitioner was more professional with the use of scalpel blade and described the laser as being more difficult to use, in addition the power emitted by the laser tip might not be the same emitted from the device as no effort was done to check it and so there might be a loss of power emitting leading to increased cutting time<sup>(13)</sup>.

### Post-operative pain

The post-operative pain that the patients felt was insignificantly different between the two methods with laser scoring slightly higher values. This goes in contrast with Jawad and Hamdi<sup>(10)</sup> who stated that laser surgery appears to be more comfortable post operatively to the patients than scalpel, the physiology of this effect remains unknown, and according to one theory, pain reduction is attributed to the protein coagulum formed on the

wound surface after laser irradiation, thus acting as a biological dressing and sealing sensory nerve fibers. Moreover, the decreased tissue trauma contributes to the reduction of postoperative pain.

This difference in results may be attributed to the fact that post-operative pain is related to the participants' perception of pain with psychology influencing the VAS score and the fact that VAS is a subjective way of measuring the pain<sup>(10)</sup>. This also goes in contrast with Shalawe et al who stated that the thin layer of denatured collagen on the surface of the lased tissue acts as a relatively impermeable membrane or impermeable dressing immediately after lasing, by this reducing the amount of tissue irritation from physical and biochemical agents in the intraoral environment and thus lased tissue exhibit minimal postoperative pain<sup>(11)</sup>. This goes in agreement with Andrew Rossi who stated that there was insignificant pain difference between the two methods although there was a trend for more pain perceived at laser treated sites and when patients were asked through questioners' about their preference, 83% preferred laser, this can't be related to pain itself as it was greater in laser treated sites but it appears to be a mental preference for a different type of procedure that did not involve the sight of blade and no "cutting" of the skin. Patient's preference is related to preconceived notions that laser is a safe futuristic effective alternative option<sup>(13)</sup>.

## CONCLUSION:

The diode laser can be used effectively for second-stage implant surgery, providing both the dentist and the patient with additional advantages over the conventional methods including adequate hemostasis, less need of anesthesia. Although there was insignificant difference in pain scoring, implant exposure by laser was more preferred by the patients.

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### المخلص

تعد زراعة الاسنان من الطرق المهمة والحديثة في عمليات التعويضات السنية، في العمليات الثانية لزراعة الاسنان هناك عدة طرق لاطهار الزرعة منها ما يكون باستخدام المشروط ومنها ما يكون باستخدام الليزر الهدف من هذه الدراسة هو للمقارنه بين كلتا الطريقتين من خلال ثلاث محاور وهي الحاجه لاستخدام التخدير الموضعي الطول الزمني للعمليه ومستوى الالم في اليوم الاول واليوم السابع بعد العمليه باستخدام مقياس الالم المرئي تم ادراج عشرة مرضى في الدراسة اجرى لهم زراعة الاسنان في الجهة اليمنى واليسرى وتم اظهار الزراعات باستخدام المشروط او الليزر تم قياس سمك اللثة فوق الزرعه مع الحاجه لاستخدام التخدير الموضعي في الحالتين والطول الزمني للعمليه مع قياس الالم المرئي في اليوم الاول والسابع كانت النتائج ذات مغزى واضح من الناحيه الاحصائيه من حيث الحاجه الى التخدير الموضعي وغير ذات مغزى من حيث مدة العمليه ومستوى الالم المستنتج من هذه الدراسة هو ان الدايدو ليزر من الطرق المعتمده لاطهار الزراعات معطيا بعض الفوائد على المشروط من حيث استخدام التخدير الموضعي وتبقى هي من الرق المفضله من الطبيب والمريض في اظهار الزراعات.