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Assessment effectiveness of low-level laser therapy on pain relief and bone loss around dental implants

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Abstract

Objectives

The goal of this study was to determine whether post-operative low-level laser therapy of the implant site has any impact on pain relief or crestal bone loss around dental implants.

Materials and Methods

In the current randomised study, 28 implants were placed in a total of 16 participants who had tooth loss in the mandibular posterior region on both sides, followed by low-level laser therapy on the investigation side. Crestal bone level was evaluated radiographically at 4 and 6 months, and post-operative pain was quantified using visual analogue scale (VAS) scoring from the start to 8 days. The data were assessed using statistics.

Result

At 4 and 6 months, the test group's mean crestal bone loss was 0.640.12 and 0.860.35, compared to 1.240.25 and 1.370.53 for the control group. There was a significant difference in the VAS pain scores between the two groups on days 2 and 4.

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Conclusion

Low level irradiation applied around the dental implants significantly lessened the post-operative pain and crestal bone loss.

Keywords: Bone loss, implant, Low Level Laser therapy, pain

Introduction

Dental implants are now a treatment option for replacing missing teeth. Implant stability is the primary clinical indicator of osseointegration. [1] Dental implants must have the supporting bone structure around them maintained for them to be successful over the long term. The term "LASER" stands for "Light Amplification by Stimulated Emission of Radiation". In contrast to normal lasers, which are frequently used to produce thermally disparaging and photocoagulation property, low level lasers are used at low power densities to ensure that the target tissue temperature does not exceed the normal (37 °C). A cutting-edge therapeutic strategy known as low level laser therapy (LLLT) has been shown to hasten bone healing. Numerous studies have demonstrated that LLLT boosts osteoblast differentiation and proliferation while also reducing postoperative pain. [2] The laser is a source of non-ionizing radiation, the effects of which can be thermal, photochemical, or non-linear on a variety of tissues. [3]

There haven't been many clinical studies evaluating the impact of low-level laser therapy on early bone loss around dental implants. Therefore, the goal of this study was to determine whether or not post-operative low-level laser irradiation of the implant site has an impact on crestal bone loss and pain reduction around dental implants.

Materials and method

The study was carried out by the oral implantology department. After receiving approval from the institutional ethics committee and participants' written consent, the current study was completed. A trained researcher conducted this study after taking into account the inclusion and exclusion criteria.

In this split mouth randomised study, 16 subjects with bilateral tooth loss in the mandibular posterior region had a total of 28 implants placed, with the test side receiving low level laser radiation. The coin flip method was used to determine whether a group was a test or control. Radiographic evaluation of the crestal bone level was performed at 4 and 6 months, and post-operative pain was quantified by visual analogue scale (VAS) scoring from the first to 8 days. The statistical analysis for crestal bone loss between groups and decrease in pain scores between groups, respectively, used the unpaired t test and Mann-Whitney U test.

Result

None of the implants had failed by the end of the study. Without any complications, all of the implants healed. There were no significant complications throughout the study. At 4 and 6 months, the test group's mean crestal bone loss was 0.640.12 and 0.860.35, compared to 1.240.25 and 1.370.53 for the control group. There was a sizable variation in the amount of crestal bone loss between the control and test groups (Table 1). The VAS pain scores of the two groups differed significantly on days two and four (Table 2).

Discussion

The preservation of supporting bone around the implant determines the success of the dental implant. The kinds of lasers that don't cause a rise in body temperature are known as low level or cold lasers. The way that LLLT influences tissue healing at the cellular level justifies its use. It was discovered that ATP synthesis increased, CcO released nitric oxide, and oxidative stress decreased when stressed cells were treated with LLLT. [2,4]

This in vitro investigation looked at the effects of low-level laser irradiation of the implant site on crestal bone loss and pain relief. We noticed less pain and less bone loss at the laser-treated site compared to the control group.

The results of Danyasi et al. showed that post-operative discomfort and crestal bone loss were significantly reduced by low level irradiation around dental implants. [2] Camolesi et al found that the use of low laser is an effective method for reducing inflammation and promoting early healing. [5] Fahmy et al. claim that LLLT clearly affects bone remodelling and improves implant stability. [3] According to Palled et al, low-level laser therapy may facilitate the healing of the hard and soft tissues surrounding implants. [6]

According to De Azevedo Kinalski et al., LLLT had no impact on the stability of implants inserted into healed sites when compared to a control group. Abol-Khair et al. found that there were no statistically significant differences between the laser and non-laser groups in terms of ridge width, bone density, or implant stability evaluated RFA. [4] It was at odds with what we discovered.

Using photobiomodulation techniques, the osseointegration process can be sped up in its early stages. [7] Garcia et al. claim that applying a laser to alveolar wounds speeds up both the healing of the bone tissue and the rate of wound closure. [8] More research is needed to verify the results.

Conclusion

It can be said that low level irradiation around dental implants significantly decreased Crestal bone loss and post-operative pain.

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Table 1: *Intergroup association of crestal bone loss at 4 and 6 months*

Duration	Group	Mean±SD	t	p
4 months	Test	0.64±0.12	3.4563	0.01
	Control	1.24±0.25		
6 months	Test	0.86±0.35	4.3668	0.03
	Control	1.37±0.53		

unpaired t test, $p<0.05$

Table 2: *Evaluation of mean pain (VAS) scores at baseline to day 8*

Duration	Test group Mean±SD	Control Group Mean±SD	U value	Z value	p
Baseline	4.34 ±0.45	4.75 ±0.43	23.0	- 1.1536	0.1383
Day 2	3.56±0.36	4.67 ±0.56	4.84	- 2.2734	0.0265*
Day 4	2.35±0.37	3.54 ±0.63	6.64	- 2.8484	0.0031*
Day 8	1.02±0.00	1.04 ±0.00	8.83	0.0000	1.0000

Test used- mann-whitney U test, $p<0.05$, *-significant